NFSA NATIONAL FIRE SPRINKLER ASSOCIATION
The Voice of the Fire Sprinkler Industry
TechNotes

Editor - Roland Asp, CET #483 03/08/2022

Best of February 2022

The following are a dozen questions answered by the NFSA's Codes, Standards, and Public Fire Protection staff as part of the Expert of the Day (EOD) member assistance program during the month of February 2022 This information is being brought forward as the "Best of February 2022." If you have a question for the NFSA EOD submit your question online through the "My EOD" portal.

It should be noted that the following are the opinions of the NFSA Engineering, Codes, and Standards staff, generated as members of the relevant NFPA and ICC technical committees and through our general experience in writing and interpreting codes and standards. They have not been processed as formal interpretations in accordance with the NFPA Regulations Governing Committee Projects or ICC Council Policy #11 and should therefore not be considered, nor relied upon, as the official positions of the NFSA, NFPA, ICC, or its Committees. Unless otherwise noted the most recent published edition of the standard referenced was used.

Question #1 – Recirculating Flowmeter with multiple Fire Pumps

Can a system utilizing multiple pumps have the discharge from the flowmeter recirculated to the fire pump(s) suction line?

Yes, a system with multiple fire pumps can utilize a single flow meter with a connection back to the fire pump water supply. NFPA 20, 2016 edition, Section 4.21.1.2 indicates where water usage or discharge is not permitted for the duration of the test specified in Chapter 14, the outlet shall be used to test the pump and suction supply and determine that the system is operating in accordance with the design. Section A.4.21.1.2 and Figure A.4.21.1.2(a) provide a diagram for this arrangement. This diagram indicates three fire pumps arranged in parallel with a single flow meter and bypass to the fire pump water source.

Question #2 – Open Stairs not in Stairwells

In accordance with the 2016 edition of NFPA 13, is the stairway protection criteria found in section 8.15.3 applicable to open stairs that are not in a shaft?

No. If a stairway is not enclosed in a shaft, the provisions of Section 8.15.3, titled “Stairways” are not applicable. Instead, the general obstruction rules such as 8.5.5.3 would apply. This section requires sprinklers to be installed under fixed obstructions that are over 4 ft in width.

Although the title of section 8.15.3 is simply titled Stairways, this is section would apply to stairs that are enclosed in a shaft.

NFSA did submit a proposal for the 2013 Edition of NFPA 13 to this section to attempt to clarify the sprinkler protection requirements for open stairs. The committee rejected the proposal, stating in the rationale that open stairs are “addressed under the obstruction rules or as a continuation of the ceiling sprinkler spacing depending on the configuration.”

Question #3 – Clearance to Storage for ESFR Sprinklers beneath Wide Obstructions

A row of ESFR sprinklers beneath a duct exceeding 24 in. width is necessary per Section 8.12.5.3.1(1) of the 2013 edition of NFPA 13.

Is the 36 in. clearance-to-storage requirement in 8.12.6 applicable to the sprinklers beneath this obstruction provided the 36 in. clearance will be maintained from the ESFR sprinklers at the roof deck above?

Yes, the requirement for a minimum 36 in. of clearance from ESFR sprinklers to the top of storage is applicable to sprinklers located below an obstruction. NFPA 13, 2013 edition, Section 8.12.6 requires the clearance between the deflector and the top of storage be 36 in. or greater and does not provide an exception for sprinklers located below an obstruction. The handbook commentary on this section indicates with clearances less than 36 in. sprinklers installed within the allowable spacing guidelines cannot provide sufficient overlapping of adjacent sprinkler discharge patterns.

The requirements for ESFR sprinklers noted above are in contrast to those permitted by Section 8.11.5.3.4 and Figure 8.11.5.3.4 for CMSA sprinklers. A reduction in clearance to storage for CMSA sprinklers located under obstructions is in the standard, however it is specific to CMSA sprinklers and not applicable to ESFR sprinklers.

These concepts have been maintained in NFPA 13, 2022 edition, Sections 14.2.12 for ESFR sprinklers and 13.2.8.3.4 for CMSA sprinklers.

Question #4 – Drum drips

Is there a specific frequency of when drum drips must be serviced or drained?

No, there is no prescribed frequency for draining auxiliary drains. Section 13.4.4.3.2 of the 2014 edition of NFPA 25 states to drain auxiliary drains after operation of the system, prior to and during freezing weather as needed.

The reason for this is that not all systems will have the same amounts of water or condensation in them and must be treated as a case-by-case basis. Annex Section A.13.4.4.3.2 provides some additional information on how to determine an interval of operation depending on the amount of discharge.

Question #5 - Low Pile Storage and Encapsulation

Does the fact that the commodity is encapsulated change the criteria of low-piled storage classification?

No. Section 4.3.1.5 does not differentiate criteria based on encapsulation therefore per Table 4.3.1.7.1.1 Discharge criteria for miscellaneous storage up to 12 ft in height, Class III commodities on multiple row racks stored up to 12 feet would require design criteria for OH2 (0.2 gpm/sq ft over 1500 sq ft).

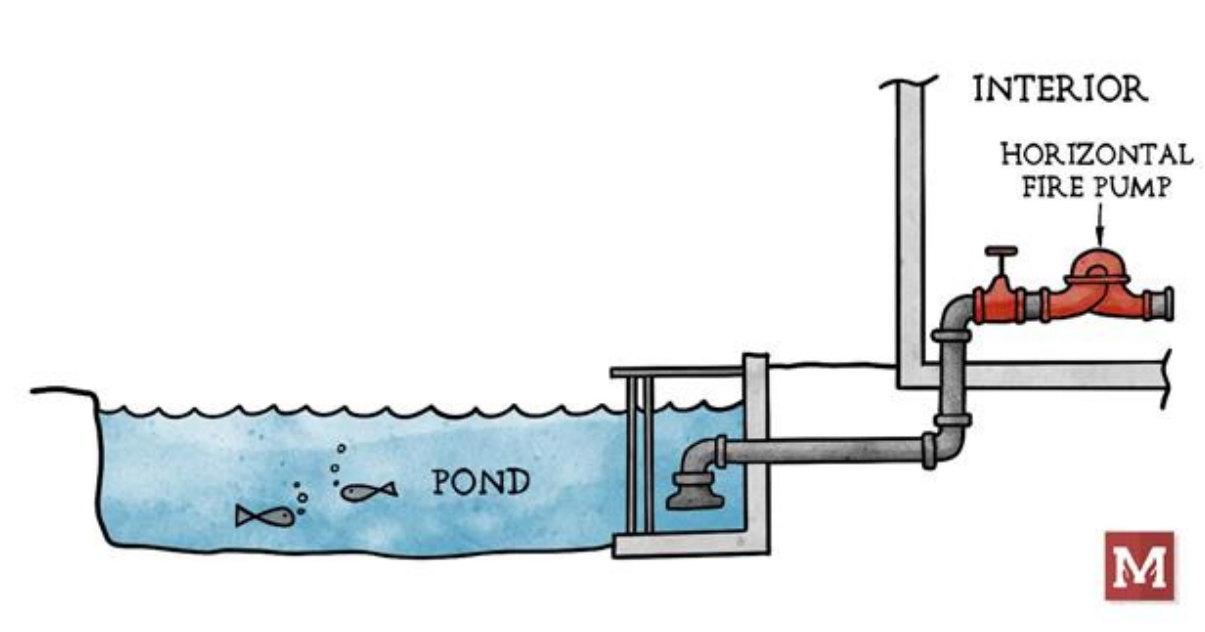
Question #6 – Horizontal Pump fed from a Pond

Is there a standard that describes specifics on how to feed a horizontal fire pump inside a building from a pond?

NFPA 20 is the installation standard, however, it is unlikely a horizontal fire pump could be used when the water supply is a pond, unless the pump is at a lower elevation than the pond and the suction line is routed below grade and below the water level all the way to the pump suction. Horizontal fire pumps are not permitted to draft, or lift water. For this reason, only vertical turbine fire pumps are used when the water supply is a pond.

Horizontal split case fire pumps are required to be continuously primed with a minimum suction pressure of 0 psi at 150 percent of the rated flow. The suction for a horizontal split case pump suction can drop to a minimum of -3 psi (at 150% flow) which only accounts for the friction loss in suction pipe between a suction tank and the pump suction flange.

It should be noted that in the past, NFPA 20 did permit horizontal fire pumps to operate under a suction lift condition. This allowance was removed from the standard in the 1974 edition and is no longer permitted.



Question #7 – Design Area Adjustments

An Extra Hazard Group 2 dry pipe system will have K-11.2, high temperature rated sprinklers and is being installed in a building with a roof slope is less than 2/12. Per Section 19.3.3.2.8.1 of the 2019 edition of NFPA 13, multiple adjustments are compounded based on the area of operation originally selected from Figure 19.3.3.1.1.

Depending on the sequence of the adjustments, is it possible to arrive at a design area of less than 2,000 square feet?

No, as stated in Section 19.3.3.2.6, when high-temperature sprinklers are installed in extra hazard occupancies, the area of sprinkler operation can be reduced by 25 percent without revising the density, but never to less than 2,000 sq ft.

Also, per Section 19.3.3.2.7, when K-11.2 or larger sprinklers are used with the extra hazard design curves, the design area can also be reduced by 25 percent but again, never below 2,000 sq ft, regardless of the temperature rating of the sprinkler used.

While it may be possible to arrive at a design area less than 2,000 sq ft it is not permitted.

The order in which the adjustments are made are not dictated except for the required minimum 3,000 sq ft for areas with sprinklered combustible concealed spaces (when applicable) must be applied last.

Question #8 – Full Flow Trip Test of a Preaction System

Is a full flow trip of a preaction system required every three years and if so, how is it performed?

Yes, a full flow of the preaction system is required every three years. The operation of the test will depend on the type of system, such as a single or double interlock system.

There are several steps to trip testing these systems. A step-by-step sequence can be found in testing procedures in the NFPA 25 2020 handbook edition.

In short, for a single interlock full flow test, operate the releasing system and if electrically released allow system pressure to stabilize then close the control valve and drain system.

If the system has a pilot line, then the system would be tripped by releasing the supervisory pressure from the system. In a double interlock system, the water to inspector's test and supervisory air tripping pressure is required to be recorded. In this type of system, the electronic release needs to be activated first verifying that the solenoid has activated. Then the inspector's test connection is opened. Note the time the valve tripped, the pressure the valve tripped and the time at which water flows steadily at the test connection (not unlike a dry pipe system test).

Question #9 – NFPA 14 - Design Basis based on 1978 Edition

The underground pipe for an existing dry manual standpipe and by doing so added 100 ft of additional pipe to the system. The AHJ wants a hydraulic calculation performed but the original hydraulic calculations have been lost or were never performed.

The AHJ will accept a new hydraulic calculation using the NFPA 14 design requirements from the era of the original design. The building was built in 1995 so it is believed the 1978 Edition NFPA 14 applies, please advise if a more recent NFPA 14 existed prior to the 1996 Edition.

The interpretation from the 1978 edition is that the standpipe system requires 500 gpm from a single standpipe at 65 psi.

NFPA 14 Standpipe and Hose System, 1978 edition, Section 2-1.2 required Class I and Class III standpipes to be sized for a minimum flow of 500 gpm, where a single standpipe was required. Where more than one standpipe was required a minimum of 500 gpm for the first standpipe plus

an additional 250 gpm for each additional, not to exceed a 2500 gpm maximum, and required a minimum of 65 psi at the topmost outlet of each of the standpipe (section 5-3.1).

Those same requirements are also found in subsequent editions in 1980, 1983, and 1987.

The 1990 edition included the 65 psi in Section 2-1.2 at the topmost outlet and the flow and pressure requirements remained unchanged until the 1993 edition.

The 1993 edition was changed due to the recommendations made from the One Meridian Plaza Fire in Philadelphia in 1991, that killed three firefighters. This edition increased the required minimum hose outlet pressures to 100 psi and modified the flow requirements to 500 gpm for the first standpipe and 250gpm for each additional not to exceed 1250 gpm flow.

If you cannot verify the adopted standard that was used in the original design, I would say it is reasonable to apply the 1993 edition to a building built in 1995, being the last edition published prior to the building's construction. This would require a minimum pressure of 100 psi with a flow of 500 gpm for the first standpipe and 250 gpm for each additional not to exceed 1250 gpm flow for a Class I dry manual standpipe.

Question #10 – Wet Manual Standpipe Calculations requiring more than 150 psi at FDC

Section 6.4.5.2.2.1 of the 2019 edition of NFPA 14 states that the pressure required sign is not required when the pressure required is 150 psi or less.

I do not believe it is the intent to limit the pressure to 150 psi; however, I am having trouble finding code references to support the use of pressure over 150 psi.

Yes, you are correct, NFPA 14 does not limited fire department connections to 150 psi. The signage requirement found in NFPA 14 Standard for the Installation of Standpipe and Hose Connection (2019) Section 6.4.5.2.2.1 requires signage on a fire department connection (FDC), only when pressures exceed 150 psi. It is a recommended "common" practice to pressurize FDC's at a minimum of 150 psi. This recommendation can be found in NFPA 13E the Recommended Practice for Fire Department Operations in Properties Protected by Fire Sprinkler and Standpipe System. NFPA 13E also recommends that pump discharge pressures should not

exceed 200 psi unless the system is designed and indicated on the sign at the FDC for higher pressure.

250 psi is widely considered a maximum pump pressure for fire department but pumping capacity does vary across the county and should be verified with the with the local fire official. Those requirements can be found in NFPA 1901 Standard for Automotive Fire Apparatus.

All components of the standpipe system must be rated for the pressure indicated and within the range of maximum allowed by the standard.

Note: all manual standpipes are also required by Section 6.4.5.2 indicating the system is wet or dry.

Question #11 – Ceiling Pockets and Concrete Tee Construction

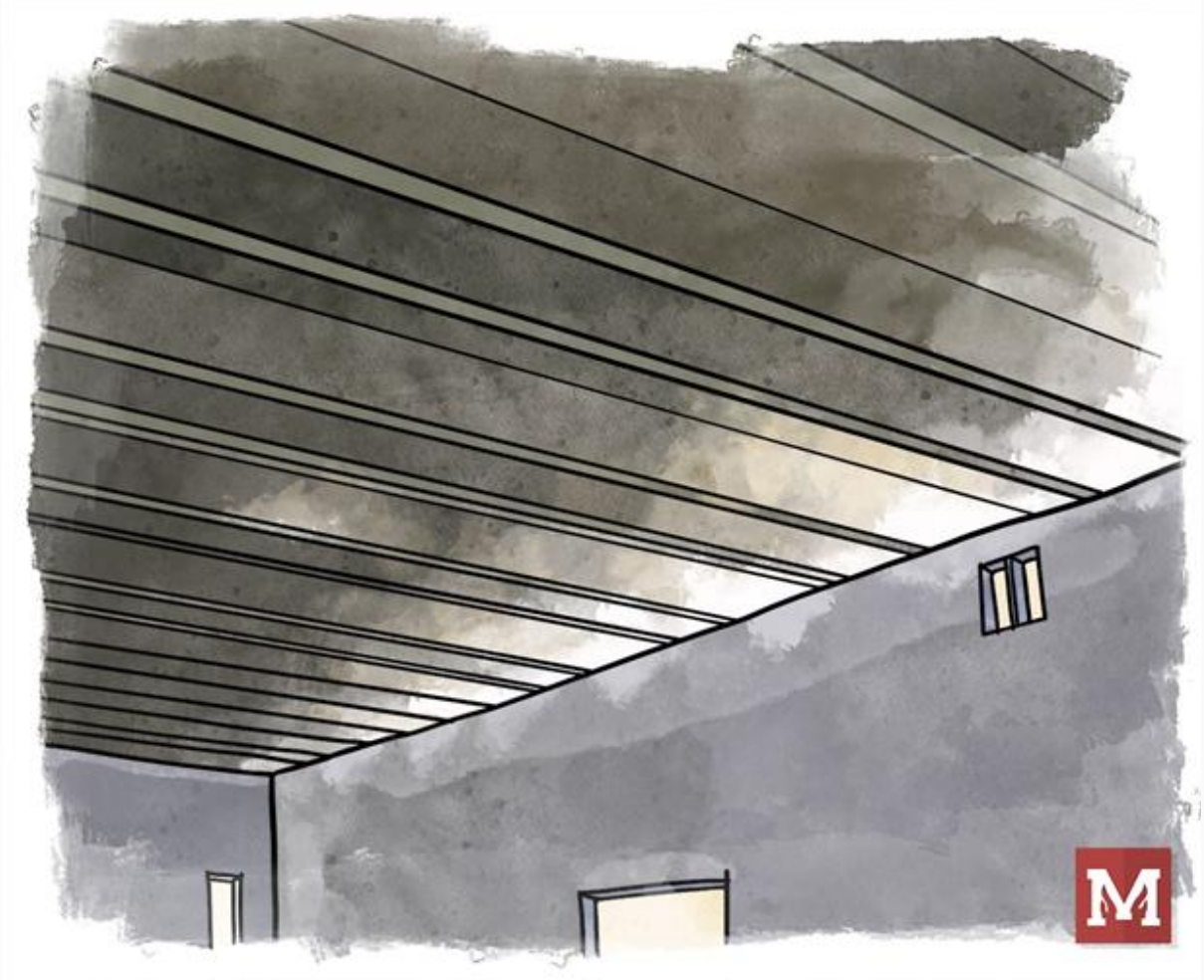
In a parking garage design extended coverage sprinklers are to be used. The construction of the parking garage consists of concrete double tees spaced approximately 4 ft-6 in apart.

Based upon the preliminary layout, their will be 2-3 structural bays between branch lines. It is being question if these structural bays are considered ceiling pockets.

Do structural bays need to be protected as ceiling pockets in accordance with Section 8.8.7 of the 2016 edition of NFPA 13?

No, the spaces between the concrete tees are not considered ceiling pockets. As stated in Annex section A.3.3.4, it is not the intent of the ceiling pocket definition to be applied to structural and/or framing members otherwise used to define obstructed or unobstructed construction.

So long as the deflector position conforms to the requirements of Section 8.8.4.1 for the construction arrangement, sprinklers are allowed to be spaced without consideration of the ceiling pocket rules dictated in Section 8.8.7.



Question #12 – Fire-Retardant vs Fire-Resistant

What is difference between fire-retardant materials and fire-resistant materials?

NFPA 701 and 703 define and provide the differences between fire-retardant materials and fire-resistant materials. For example, NFPA 703, 2021 edition, Section 3.3.1 defines fire-retardant coating as a coating that reduces the flame spread index of Douglas fir, or of any other tested combustible surface to which it is applied, when tested in accordance with a test for assessing

surface burning characteristics. Section 3.3.2 defines fire-retardant-treated wood as a wood product impregnated with chemical by a pressure process or other means during manufacture, treated to exhibit reduced surface-burning characteristics and resist propagation of fire.

NFPA 13, 2016 edition, Section 8.15.7.2 indicates sprinklers shall be permitted to be omitted where the exterior canopies, roofs, porte-cocheres, balconies, decks, and similar projections are constructed with materials that are noncombustible, limited-combustible, or fire retardant–treated wood as defined in NFPA 703, or where the projections are constructed utilizing a noncombustible frame, limited-combustibles, or fire retardant–treated wood with an inherently flame-resistant fabric overlay as demonstrated by Test Method 2 in accordance with NFPA 701.

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National Fire Sprinkler Association
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1-800-683-NFSA (6372)

Contact Us

National Fire Sprinkler Association
514 Progress Drive, Linthicum Heights, MD 21090
1-800-683-NFSA (6372)